

Design and Implementation of Vapor Extraction and Recirculation Systems for Environmental Remediation in an Active Industrial Area

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In an active industrial warehouse located in Brazil, environmental investigations identified an area with presence of chlorinated organic compounds (PCE and TCE) above the reference standards recommended by local environmental authorities for inhalation of indoor vapors. For this scenario, an integrated remediation system comprised of a soil vapor extraction (SVE) and groundwater directed recirculation system (GDR) were designed. The goal of this system was to reduce compound concentrations and the risks inside the industrial warehouse. The SVE is designed to act in the unsaturated zone and the vacuum applied in the wells promotes the extraction of the volatilized contaminants from the hot spots. Extracted vapors are directed to a vapor treatment system. The GDR system acts in the saturated zone to create a groundwater circulation with hydraulic control, that reduces concentrations in the hot spots by promoting the exchange of soil porosities. This effect accelerates the transfer of residual or adsorbed mass to the aqueous phase, which will be extracted and treated in a groundwater treatment system.

The engineering project was developed based on the high-resolution investigation results and had the objective of generating the least interference between the production routine of the industrial warehouse (2,500 m² area), the construction activities and operation of the remediation system. The installed pipes are primarily aerial with few buried sections. Gas flow controls extracted from the wells are installed in cabinets with manifolds located at strategic points fixed on the warehouse's walls and pillars. The planning of the works' implementation considered engineering and construction management skills that allowed the implantation of 53 wells in the industrial warehouse area (42 of the SVE system and 11 of the GDRS) in 14 days during the productive recess of the industry. The remaining works outside the productive area were distributed in an implementation schedule that had a total duration of 2 months.

A good engineering design and a well-orchestrated field work allowed the implementation of the remediation system without any impact in the facility current production routine. For two weeks, periods of construction inside of the warehouse area, activities with approximately 60 people, handling 4 drilling machines, 4 manual auger staffs and construction contractors were coordinated simultaneously. The system was installed according to the planned time frame and it was started in April 2018.